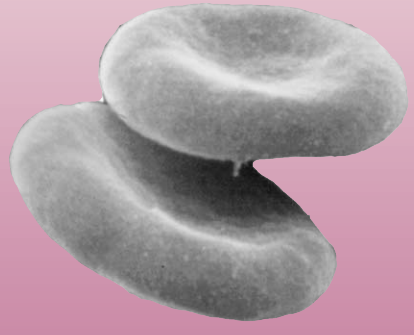
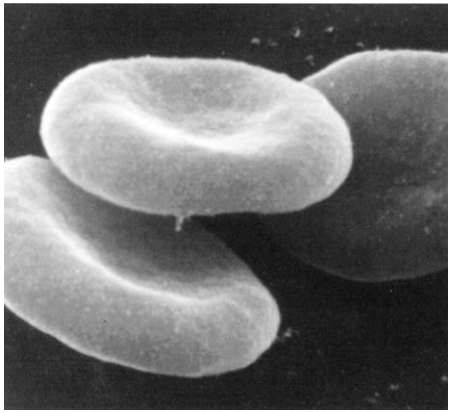
All You Wanted to Know



About

Sickle Cell Trait



Normal red blood cells

Introduction:

So, you have just learned that you, or someone you know, has sickle cell trait.

Many things must be going through your mind. What does it mean, and does it make me different from other people? Is it dangerous?

Having sickle cell trait simply means that your red blood cells contain a different type of hemoglobin (a component of the red blood cell) in addition to the common type.

Having this trait does not make you any more different from other people than you already are; you are taller or shorter than some people you know; the shape of your nose and ear is different; in other words, you are an individual!

Aside from some minor exceptions that we will explain, sickle cell trait is *not* harmful to one's physical or emotional health.

In fact, you would have never found out about your sickle cell trait, unless you had this special blood test. Now let us talk in some more detail about the trait.

What is sickle cell trait?

As we said earlier, sickle cell trait means having a different hemoglobin, in addition to the most common type of hemoglobin. Hemoglobin is the component of our red blood cells that gives our blood its red color, and carries oxygen from the lungs to all other parts of the body.

Most people have only hemoglobin A. In contrast, people with sickle cell trait have both hemoglobin A and hemoglobin S.

Hemoglobin S is very similar to hemoglobin A except for one change in its structure. There are many other types of hemoglobin that are also different from the common type. Examples include hemoglobins C, D, and E.

How does one get sickle cell trait?

Hemoglobin types are inherited like eye and hair color. Individuals with sickle cell trait have inherited the trait from one of their parents.

Is it true that only people of African ancestry have sickle cell trait?

No, it is not. Sickle cell trait occurs in about one out of ten African Americans. In addition, this trait is found among people with ancestors from the Mediterranean area, Mexico, and Central and South America.

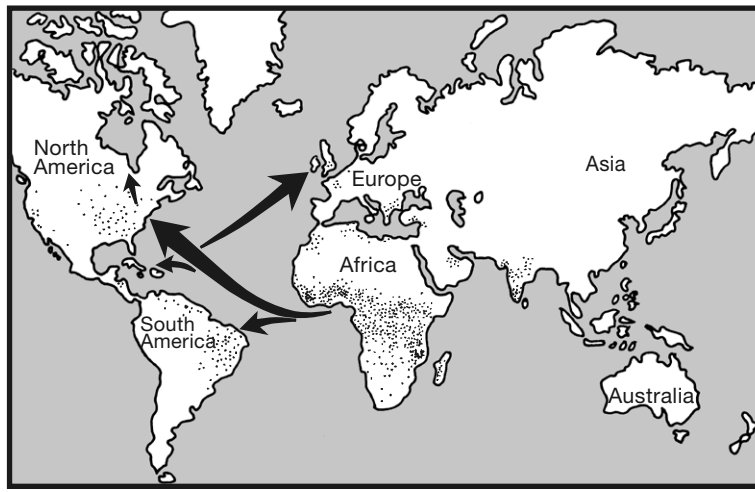
Sickle cell trait originated thousands of years ago in areas of the world that had malaria.

Interestingly, people with sickle cell trait were more resistant to malaria and were better able to adapt to their environment.

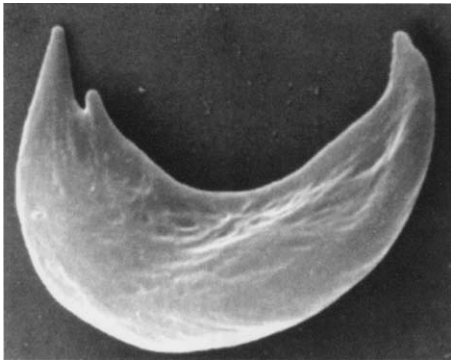
Certain genetic conditions are more likely to occur in some populations than in others. For example, "thalassemia" is a blood condition that is common in Asian and Mediterranean populations.

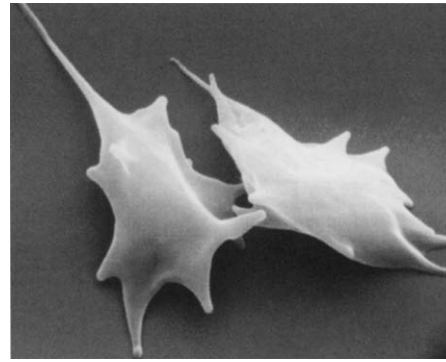
Does sickle cell trait lead to any health problems?

Sickle cell trait rarely causes any medical problems. Two exceptions should be mentioned, although they are uncommon. An individual with sickle cell trait may experience



Areas of the world where sickle hemoglobin or its variants are found





"Sickled" red blood cells

a painful episode when exposed to low oxygen pressure.

This may happen, for example, when going to very high altitudes (greater than 10,000 feet) or flying in an unpressurized aircraft. Another exception involves the kidney. Individuals with sickle cell trait may occasionally have hematuria, which means microscopic amounts of blood in the urine. This condition is generally harmless.

What is sickle cell disease?

When an individual has only hemoglobin S and no hemoglobin A, then he or she has sickle cell disease. When red blood cells containing hemoglobin S release their oxygen to the tissues, they change shape from round to sickled (see illustration). This impairs their passage through the small blood vessels.

Since red blood cells are very important for oxygen delivery throughout the body, sickle cell disease can affect many organs as well as growth and development.

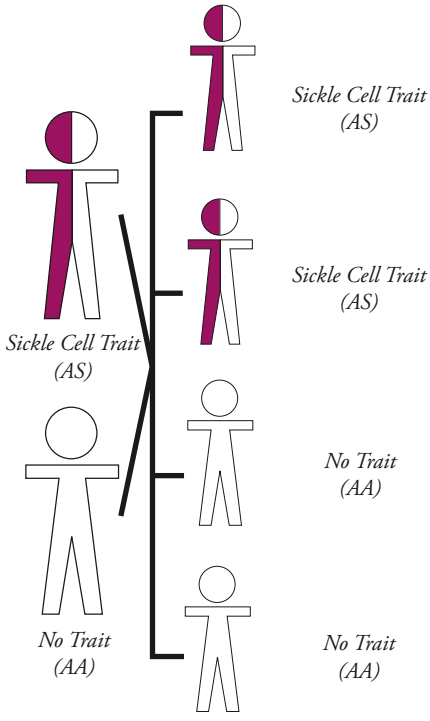
Sickle cell disease may be a severe disease. Although it cannot be cured, effective treatment is available for persons with sickle cell disease.

Can sickle cell trait develop into sickle cell disease?

No! Sickle cell trait is *not* a disease. Individuals with sickle cell trait will *never* develop the disease.

Diagram I

When only one of the parents has a hemoglobin trait:



On the other hand, persons with sickle cell trait will never "outgrow" the trait.

If I have sickle cell trait, can my child have sickle cell disease?

The genetic makeup of your child comes equally from you and your partner. Just like hair and eye color, your child will inherit his or her hemoglobin pattern from both of you. That is why both you and your partner should be tested.

If your partner does *not* have a hemoglobin trait, then none of your children will have sickle cell disease. With each pregnancy, you will have a 50% chance of having a child with sickle cell trait just like you. *(See Diagram I)*

If your partner also has a hemoglobin trait, then the possible outcomes with each pregnancy depend on the *specific* trait he or she has. If your partner has sickle cell trait, there are *three* possible pregnancy outcomes:

1. A 25 percent chance for a child without any hemoglobin trait.

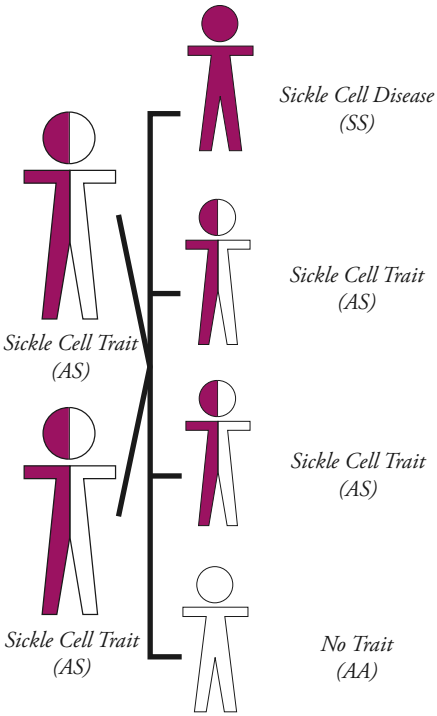
2. A 50 percent chance for a child with sickle cell trait.

3. A 25 percent chance for a child with sickle cell disease. *(See Diagram II)*

So, *both* you and your partner must be tested to find out if there is a chance of having a baby with sickle cell disease.

Diagram II

When both parents have a hemoglobin trait:



What shall I do if my partner has a hemoglobin trait as well?

If both you and your partner have a hemoglobin trait, then there are several options that are open to you. When the parents wish to know whether the unborn baby has sickle cell disease, testing can be performed as early as the tenth week of pregnancy.

If the results are normal, the parents can be reassured. If the results show that the baby will be affected, the parents can be better prepared and they can make informed decisions regarding the pregnancy.

To discuss these issues, you will need to contact a genetic counselor and ask for a counseling appointment. Counseling will provide you with important new information about hemoglobin traits and diseases and reproductive issues.

For more information about sickle cell trait or disease, contact:

Produced by: Northern California Comprehensive Sickle Cell Center
Supported by: NIH grant HL20985

Written by: Ilana Mittman, M.S., Genetic Counselor
Edited by: William M. Lande, M.D.
Cell photographs: Margaret R. Clark, UCSF
Design: Lydia Young, UCSF Publications Office

This pamphlet was reproduced by the California Department of Health Services, Genetic Disease Branch, with permission of San Francisco General Hospital.

Revised 2006